

CHAPTER 6

MATERIAL CUSTODY, MATERIAL STOWAGE, MATERIAL HANDLING EQUIPMENT, AND SAFETY

Each year, the Navy spends billions of dollars in the logistical process to ensure fleet readiness at the highest level. Storage and warehousing of material, which include the physical and accountable aspects of the Navy inventory, are critical elements of the logistical process. These elements directly affect fleet readiness. Each part of supply management is responsible for ensuring that Navy material is properly cared for. There are several functions related to the care of material. These functions include accountability, physical security, stock rotation, material handling, inventory, and quality control. To understand the aspects of material storage and warehousing, you should understand each of these functions. This chapter describes these functions in detail.

MATERIAL CUSTODY

Custody means immediate charge and control exercised by a person or authority over a property or record. As an AK, your job will include protecting and maintaining material in the custody of your activity. These materials may be in supply department spaces or in other departments. The custodial responsibility for Navy material depends on different situations. The following text describes these situations.

MATERIAL IN SUPPLY DEPARTMENT SPACES

The supply officer is responsible for the storage, security, and inventory control of material stowed in storerooms. This includes material stored in other areas assigned to the supply department. The supply officer may delegate this responsibility to the person in charge of the storeroom or stowage area.

MATERIAL IN CUSTODY OF OTHER DEPARTMENT HEADS

Sometimes, it is necessary to store bulk items under the control of other department heads. Stowage of supply stock items in other department spaces must have a written authorization by the commanding officer. The authorization will specify the supply officer's

responsibilities. These responsibilities may include procedural instructions, stock replenishment, physical inventory, and record maintenance. The authorization also should include the responsibilities of the other department heads. These responsibilities may include storage, security, inventory, and location of material.

When supply department stock is stored in other spaces, the other department heads appoint (in writing) custodians for the material. The supply officer is responsible for providing detailed written instructions and procedures to the assigned custodians.

The supply officer is responsible for maintaining stock records of all material stored in other department spaces. The supply officer will provide a listing of the stock material to each departmental custodian. The custodian only maintains the stock location records. The custodian is responsible for the prompt submission of completed transaction documents to the supply department for processing.

MATERIAL IN SUBCUSTODY OF OTHER DEPARTMENT HEADS

The location of other items or material may be in the operating and maintenance spaces of other departments. These items include maintenance assistance modules (MAMs) issued on subcustody to other departments. The MAMs are avionics system parts used for isolating faults within an avionics system or test set. Fault isolation is done by substituting the parts with a MAM item. A MAM also enables end-to-end testing within a test program set (TPS).

The MAMs are not carried on the supply officer's stock records as part of the spares inventory, but are expended to the end user. MAMs are not included in the operating site's fixed allowance. However, MAMs are listed in the aviation allowance list (AVCAL/SHORCAL) and under the permanent custody of the supply officer. In turn, the supply officer issues the MAMs on subcustody to maintenance personnel. The supply officer maintains the custody records of repairable MAMs. The MAMs assets do not require a report to the Aviation Supply Office (ASO). Refer to FASOINST 4790.1 (series) for procedures on MAMs.

SECURITY OF MATERIAL

Stored material must be kept under lock and key in all cases. The exception for this requirement is when the material quantity and size make storeroom storage impractical. Storeroom spaces must be locked securely when not in use. Personnel in charge of the storage space are responsible for maintaining security for all stores in their custody. When storage spaces are open for use, an authorized person must be present. Other personnel may enter the space only when necessary for stowage, breakout of material, or emergencies.

Inspections

Personnel may access stowage spaces for inspections and as directed by the commanding officer. However, the inspectors will not be given keys to the spaces. They will be escorted by responsible supply department personnel.

Access for Emergencies

Access to stowage spaces is authorized to damage control personnel in the performance of their duties. Stowage spaces must be secured in such a manner that damage control personnel can open the space by use of ordinary damage control equipment in an emergency.

Permission for Entry

Only the supply officer can grant permission for entry of persons not ordinarily authorized access to stowage spaces. During the supply officer's absence, the assistant supply officer, special assistants, or supply duty officer can grant permission for entry to spaces.

Key Control

Key control procedures must be set by the activity. This procedure permits identification of the person holding the key to any stowage space at any given time.

CONTROLLED EQUIPAGE

The term *equipment* refers to those durable and uninstalled items that are located in operating spaces to support operational, maintenance, or administrative functions. Some of the equipment items are binoculars, cameras, guns, and typewriters. The term *controlled equipment* refers to those items of equipment that require special management control. These items require special control because they are essential for protection of life. These items are valuable and easily converted to personal use. Appendix 11 of NAVSUP P-485 lists those items classified as controlled equipment. Controlled equipment used on board ships will be in the custody of the department head responsible for the particular

equipment. The department head is responsible and signs for all controlled equipment in the department. The department head may delegate the physical custody of controlled equipment to other officers or enlisted personnel in the department.

MATERIAL STOWAGE

The term *storage* refers to the keeping or placing of property in a storeroom, warehouse, shed, or open area. The term *stowage* is synonymous with storage. For stowage of material afloat, you must know how to determine the stowage layout best suited for the material. Also, you must know the precautions to be taken to safeguard both the stores and the ship.

BASIC STOWAGE CRITERIA

To maintain control of material, you must meet the basic criteria for storage. These criteria include the following:

- Ensure maximum usage of available space
- Provide orderly stowage and access
- Prevent damage to the ship or injury to personnel
- Reduce the chance of material loss or damage
- Ease and ensure issue of the oldest stock first
- Make inventories easier

TYPES OF STORAGE FACILITIES

Storage facilities are the basic resources of the supply department, both afloat and ashore. Maximum use of storage space can save operational costs and promote efficiency of operation.

Types of Storage Facilities Ashore

The following paragraphs describe the general functions of the most common types of storage facilities used by the Department of Defense.

COVERED STORAGE SPACE.— The covered storage space is storage space within any roofed structure. This class includes various structure types. Only those types that are of significance to the AK are discussed here. They are general-purpose warehouses, refrigerated warehouses, flammable storage warehouses, and sheds.

The general-purpose warehouse has a roof, side walls, and end walls. This type of warehouse may have a heating unit installed. The Navy uses this type of warehouse for various storage functions. The building may be single or multistory, although the single-story

building has become the standard warehouse. The location of office space in this type of warehouse may be within the building or outside of the warehouse. In either case, the location of the office space is on the same side of the warehouse as the truck docks.

Normally, two main aisles run the length of the warehouse. This is to allow material handling equipment supplies to move straight through the length of the warehouse. Typically, cross aisles connect the main aisles. The functions found in the general-purpose warehouse include retail issues, bulk storage, receiving, shipping, preservation, security areas, and administrative offices.

The refrigerated warehouse outwardly resembles a general-purpose warehouse, although it is usually smaller. This warehouse is usually in two separate parts. One part is a chill space with controlled temperatures between 36°F and 46°F. The other part is a freeze space that allows control of the temperature below 32°F. Because the chill and freeze spaces divide the refrigerated warehouse, there are no main aisles that run the length of the entire warehouse.

The flammable storage warehouse is built of noncombustible material and has fire walls with a 4-hour fire-resistance rating. The main source of protection comes from an alarm and automatic sprinkler system.

Sheds are buildings without complete sides and end walls. The Navy uses sheds for storing materials that require maximum ventilation or materials that do not require complete protection from the weather.

OPEN STORAGE SPACES.— The open storage spaces are improved or unimproved open areas used for storage purposes.

The open improved storage spaces include graded spaces or areas and areas surfaced with concrete, tar or asphalt, gravel, or other suitable topping. The Navy uses these spaces for storing certain materials invulnerable to damage by adverse weather conditions.

Open unimproved storage spaces are unsurfaced open areas used for storage. The significant disadvantage of this type storage is the limitation on the use of material handling equipment.

Types of Storage Facilities Afloat

There are several types of storerooms afloat. In most ships, the general stores (S-1) and aviation stores (S-6) divisions use the same spaces to store material common to both. Storage locations of material specifically used by the ship are in spaces assigned to the S-1 division. Aviation items are stored in spaces assigned to the S-6 division.

The main issue storeroom is the space set by the supply officer as the central distribution point for the general stores division. Generally, this space is the most accessible of all stock stowage spaces when watertight integrity restrictions are in effect. This storeroom contains a locator system either in manual or automated format. All receipt and expenditure documents normally channels through the main issue storeroom.

The bulk storerooms are spaces used for storing wholesale quantities of small items and heavy and bulky material.

The repair parts storerooms are spaces used for stowage of all repair parts. The only exceptions are those bulkhead-mounted spares and material authorized for stowage in other departments. Repair parts storerooms contain stowage aids, such as bins, drawers, shelves, racks, and cabinets used for stowing material. Material needed to support aviation maintenance is stored in the maintenance support package (MSP) storeroom under the S-6 division. Aviation repairable parts are stored in separate storerooms in the S-6 division.

The flammable liquid storeroom can be at either end of the ship, below the full load waterline. This space must be as far away as possible from the magazines. This storeroom must have automatic fire alarm and fire-extinguishing equipment (CO₂ or HALON system). Also, this storeroom should have incandescent and explosionproof overhead lights (protected by lamp guards) with the switch outside the compartment. Flammable items stored in this storeroom have an assigned material content code (MCC) of D, F, G, P, S, and Z in the Hazardous Material Information System (HMIS). Refer to the HMIS and NAVSUP-P485 for information concerning handling of hazardous materials.

TEMPORARY STORAGE OF SHIPBOARD MATERIAL BY SHORE ACTIVITIES

When necessary, ships may use shore facilities to store material temporarily. Temporary storage of allowance list items of equipment or equipment over 1 year must have prior approval by the type commander. Consumable materials, tools, and other items required to support ship's equipment and equipment will not be offloaded for temporary storage. However, some items may be offloaded as authorized during shipyard, overhaul, conversion, or change of mission. The ship requesting storage is responsible for arranging the offload and return of material. The requesting ship is also responsible for informing the storage activity of any change in the length of storage.

Types of Temporary Storage Facilities

The supply officer may designate the use of transit sheds or butler huts to support the department's functions. When used, they should provide the safeguards, storage characteristics, and special storage requirements needed for security purposes.

Pierside trailers may be used for the temporary storage of supply department material when authorized by the supply officer. The type of materials and security requirements should be considered before using the trailers.

When authorized, ships may also use other shore-based facilities for temporary storage of material.

Identification of Temporary Storage Material

Material offloaded to shore activities for temporary storage must be boxed, tagged, and marked to provide ready identification. Each piece or container to be stored must be numbered consecutively.

Documentation of Temporary Storage Material

The Requisition and Invoice/Shipping Document, DD Form 1149, is used for material offloaded for temporary storage. The form includes a notation MEMORANDUM INVOICE ONLY in data block 4. The next number from the expenditure invoice log is assigned for control only. You must place one copy of the DD Form 1149 inside each container. Also, you must place one copy of the DD Form 1149 inside a waterproof envelope securely attached to the outside of each container. The DD Form 1149 must contain the description, quantity, and classification of the material. Also, it must have the type of storage required and the length of time of temporary storage.

MATERIAL PROTECTION

Items procured for the Navy have some degree of preservation packaging and packing that is required by the item manager. The packaging should protect the material from deterioration and damage during shipment, handling, and stowage. The protection levels specified are code-marked on unit packages and exterior shipping containers. Level A provides protection against the most severe conditions expected. Level B provides protection for less severe conditions. Level C provides protection for known favorable conditions.

Most materials received by afloat units are packaged and packed before shipment. Ship's personnel are responsible for retaining repair parts in their original packaging until issued. They are also responsible for providing adequate protection of material while it is in storage. Also, material must have adequate protection

during shipment. This includes shipment of unserviceable, mandatory, turn-in repairable items to another activity.

LOCATOR SYSTEMS

The stock locator system eases processing receipt, issue, and shipment of material. The location of each item in stock is recorded in the related stock record by using manual or automated files. This record should contain only as much information as necessary to find the material. The stock locator file is the heart of a stock location system. It is the address directory for all stored material.

Locator Systems Ashore

Locator systems ashore are different and more complicated than those afloat. To understand the locator system ashore, you must understand storage layout, location number format, and locator files.

The design of a locator system includes a planograph. The planograph is a drawing of the actual layout of a storage area. It portrays the subdivision of the gross space within the storage space. A planograph placed on the bulletin board enables the stock person to match the location on the locator file with the floor plan. The stock person may then proceed directly to the location of the stored item.

The automated system in use today allows faster response for inquiries concerning stock items. You must learn the procedures for using these computers according to your activity's instructions. Supply transactions, such as receipts, issues, transfers, or surveys, require posting into the computer system. The posted transactions keep the information in the system current.

When stock numbers have more than one location for small lots, the material should be combined into one location. Combining material into one location requires judicious planning. Usually, you can minimize relocation of material through attrition. Transfer of material between storeroom/warehouses or to different locations in the same storeroom/warehouse requires supervision by the leading storeroom AK. The leading storeroom AK is responsible for the following:

- Protecting the material from loss or damage during the move
- Ensuring proper stowage of material in the new location
- Ensuring prompt and accurate recording of new locations into the stock records or files

STORAGE LAYOUT.— Storage space ashore is subject to considerable variations, depending upon the

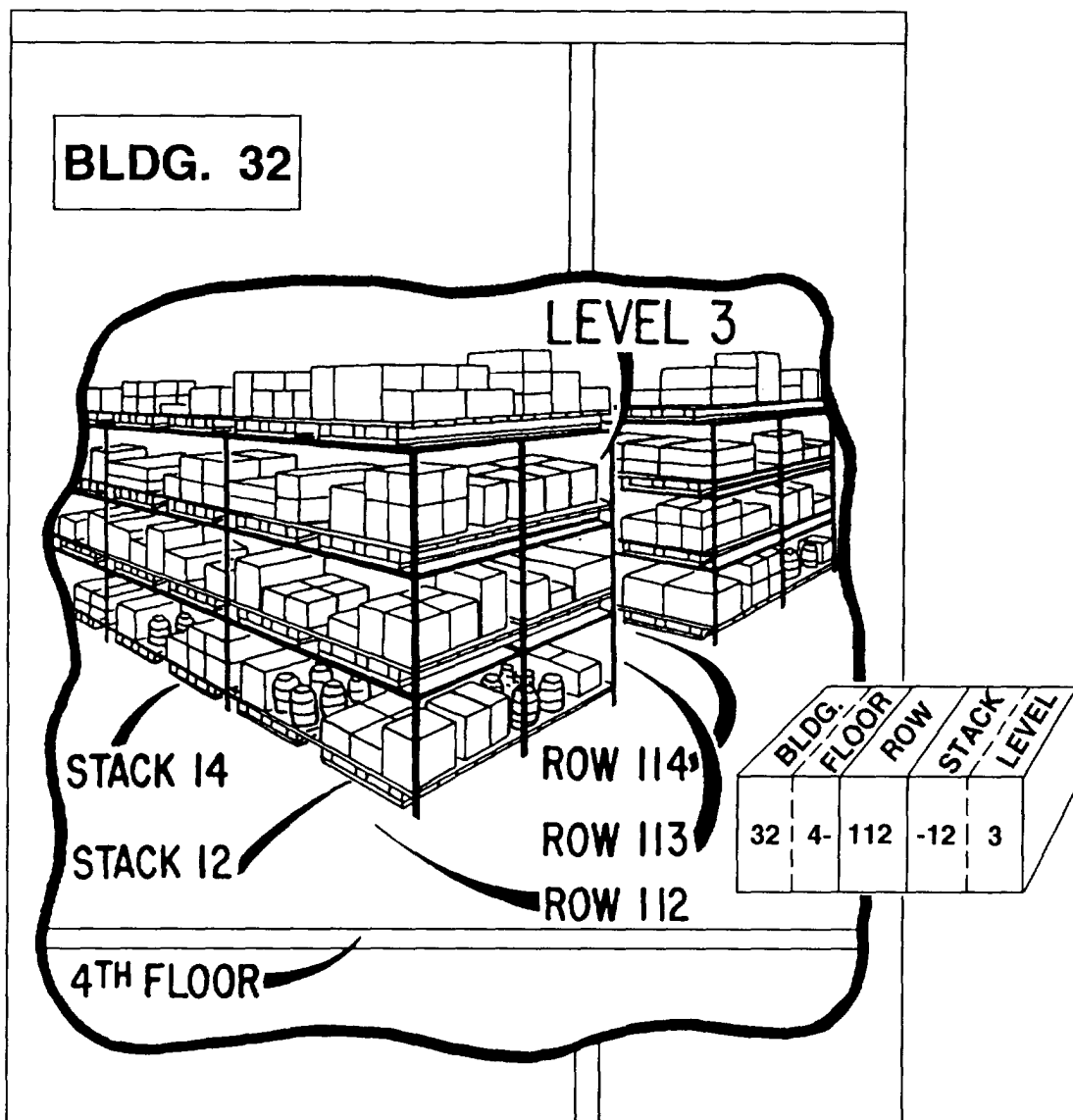


Figure 6-1.-Sample of location number and typical warehouse floor plan and storage area.

mission of the station. Some activities have multistory buildings that contain both office and storage spaces. In its broadest sense, storage space includes the area within the warehouse. This includes the entire area designated as an open storage area. However, this area includes spaces assigned for such functions as preservation and packaging, packing and crating, receiving, shipping, inspection and identification, screening, and offices. The space excluding these items and any other space is the gross space for storage. Net storage space is the area occupied by bins plus pallet rack space. Aisles makeup the difference between the gross space and net storage space.

LOCATION NUMBER.— A significant location number is one that enables personnel who are not

familiar with a storage area to locate an item of stock. Each character or group of numbers that make up the location number plays an important part in locating an item in the storage space. The location number consists of the building, floor, row, stack, and level.

Normally, the location number consists of nine numeric digits separated into three groups by dashes; for example, 123-456-789. The first three digits identify the warehouse and the floor number. As in the example, the 12 indicates the building number and the 3 indicates the third floor. The second group of three digits (the 456 in the example) is the row number. The third group of three digits is the number of the stack. As in the example, the 78 shows the stack or the specific crosswise location on a row. The last digit in the example, the 9, shows the level within the stack. See figure 6-1 for a sample

location number and view of a typical warehouse floor plan and storage area.

LOCATOR FILES.—Automated shore and afloat activities maintain stock location data files in the computer system. This type of operation provides accuracy and speed. Automated systems can provide a printed listing of stock location information, from the computer data file, for manual use. Only authorized personnel should have access to computer files. The Shipboard Uniform Automated Data Processing System—Real Time (SUADPS-RT) uses the material location files (MLF). The MLF is capable of recording more storage locations in addition to the four locations in the basic material file (BMF). Refer to *SUADPS-RT Support Procedures*, volume 1, chapter 2, for more information.

In the manual stock locator file, all work is performed by hand. The manual system uses related stock records or the Afloat Locator/Inventory Record (NAVSUP Form 1075) for recording the location of each item of stock. An activity uses this type of locator file for managing a few items of stock. Some activities use this system particularly for high-demand or for slow-moving items.

Location Systems Afloat

Ships use either automated or manual systems to maintain files and records. This includes updating the location of each item in stock. There are several factors that you must consider in assigning a location for an item. Stowage of materials depend on the types, quantities, and characteristics of the materials. Other factors for stowage include security and safety requirements for storing the material.

There are other factors that you must consider before assigning available stowage space for the material. You must give consideration to the class of material and the volume of needed stowage space for each class. Some of these materials are bulk items, tires, aviation repairable, and electronic modules. Consideration must also be given to the physical characteristics of the material. Characteristics of the material include the weight and size. Some materials are fragile, flammable, susceptible to damage or theft, or have other properties that may affect the safety of the crew or ship. In addition, consumable and repair parts should be segregated to ease issue and inventory processing. As an example, the location for fast-moving items should be in an area with easy access for issues and replenishments.

The number, location, shape, and size of storerooms vary in each type of ship. The supply officer studies the configuration and capacities of all stowage space to determine the types and quantities of material to be stowed in each. Things to consider in planning the storeroom layout are location of storeroom doors, hatches, stanchions, ventilation ducts, overhead fixtures, and other structural aspects.

The first element of a location system is a logical and systematic numbering system. The storerooms are identified by number (or letter), beginning from the forwardmost and uppermost level on the starboard side. This numbering progresses from the starboard to the port side and from the upper level to the lower level of the ship. The first two digits of the location number contain the storeroom number. Other characters of the location number are the row, stack level, or bin number. You should familiarize yourself with the location system used in your ship.

Under the Shipboard Uniform Automated Data Processing System (SUADPS), you can query the location of an item from the computer. Also, you can find the location of an item in the Master Stock Status and Locator Listing (MSSL). The MSSL is a printout of certain essential data elements from each stock record in the basic material file (BMF).

STOWAGE AIDS

The ship's storerooms may contain bins, racks, shelvings, lockers, drawer cabinets, deck gratings, battens, and other stowage aids for storing material. Warehouses ashore have bigger storage spaces and can accommodate other storage aids. These aids include pallet racks, pallet support sets, dunnage, cantilever racks, and box pallets.

Pallets

A pallet is a low portable platform constructed of wood, metal, or fiberboard. Its standard measurement is 40 by 48 inches, and it is manufactured with flushed or winged ends. Pallets may afford a two-way or four-way entry. The construction of a two-way entry pallet allows the forks of a forklift to enter either the front or rear of the pallet. The four-way entry pallet allows entry of forks from any of the four sides of the pallet. Pallets help to move a greater number of material pieces at one time. Also, it speeds up handling and reduces higher stacking. There are several factors that determine the number of containers that can be stacked on a pallet. These factors include size of the pallet, size and shape of the material, and weight of the item. Also, you must consider the

material handling equipment (MHE) used for moving the pallet. The factors to consider are the lifting capacity and lifting height limit of the MHE. For example, when you use a forklift truck to stack three pallets high and maintain uniformity, the height of the lower two pallets should not exceed 102 inches. Also, you can do this by having an average height of 51 inches for each pallet load.

In forming pallet loads, you must not exceed the lifting capacity of forklift trucks at the specified distances from the heel or fork. Most 2,000-pound forklift trucks will lift 2,000 pounds if the load does not extend beyond 24 inches from the heel or fork. However, for every inch the load protrudes beyond this point, a sharp reduction in lifting capacity occurs.

The following paragraphs describe the types of stowage aids derived from pallets.

The box pallet is an adaptation of the standard pallet. A simple superstructure built on the pallet gives it the appearance of a crate or box. Warehouses use the box pallet for storing odd sized items or weak containers that will not support the superimposed load. If you use box pallets for stacking small lots, it permits higher stacking.

The pallet rack provides support for pallets that is independent of the lower loads. Use of pallet racks are common to shore activities. Warehouses use them to store material that is not strong enough to support the load. Other uses of pallet racks include storing material with irregular shapes or material that is too small for bulk storage and too large for bin storage.

The primary usage of the safety pallet is to elevate personnel both for maintenance work and moving material to and from storage. Handling a safety pallet is the same as handling an ordinary pallet except that it is secured to the forklift truck. Safety pallets provide safety when lifting personnel and material to high places where forklifts cannot approach at a right angle.

Dunnage

There are different types of dunnage used in warehousing and material storage. The floor dunnage is used to protect stock from possible damage from water flows or dampness from the floor or ground area. The short dunnage maybe cut from salvaged lumber and is used for separating the containers to permit the use of a forklift truck. The dunnage used in handling containers must be shorter than the container. Vertical dunnages are pieces of dunnage used in vertical positions to stabilize crushable items. The purpose of using vertical dunnage is to spread the weight of pallet loads. Usually, dunnage consumes less storage space than a pallet. Dunnage may be made from salvaged lumber at little cost; therefore, it should be used in lieu of a pallet.

Collars and Notched Spacers

The purpose of collars is to protect the valves of the compressed gas cylinders from the weight of the upper pallets. Collars provide this protection when compressed gas cylinders are in an upright position. To prevent accidental tipping, cylinders stacked vertically must be bound with steel strapping to stabilize the load.

Notched spacers are used for horizontal palletizing of compressed gas cylinders. This method of palletization permits the issue of a single cylinder without disturbing the balance of the unit. Notched spacers also prevent compressed gas cylinders from rolling out of the stack. For additional protection, use wire or steel strapping to bind the pallet when transporting cylinders for long distances or over rough terrain.

MATERIALS REQUIRING SPECIAL HANDLING

Certain materials with inherent hazardous properties, delicate instruments, classified items, and pilferable material require special handling or stowage. The following paragraphs describe these materials and the safety procedures for handling them.

Hazardous Materials

The *Naval Ships' Technical Manual*, chapters 670 and 9230, and the DOD Hazardous Material Information System (HMIS) outline the requirements for shipboard use and storage of dangerous and semisafe materials. The DOD 6050.5-LR lists these items under each classification. The HMIS also includes the procurement, transportation, physical, fire-fighting, spill, and leak information for each item. To determine the storage requirements of the item, cross-reference the type storage code from HMIS to the code listed in appendix 9 of NAVSUP P-485 or appendix 8 of NAVSUP P-567. Disposal of hazardous materials will be in accordance with the following publications:

- OPNAVINST 5090.1 (series), *Navy Environmental and Natural Resources Manual*
- *Naval Ships' Technical Manual* (NSTM), chapter 593, Pollution Control
- NAVSEAS9593-A7-PLN-010, *Shipboard Hazardous Material/Hazardous Waste Management Plan*

The labeling of hazardous material should provide enough information about the hazard presented by the material. Storage tanks and pipes containing hazardous

material also must be labeled. Stock hazardous material should be at the minimum quantity required to meet the operational requirements. The following paragraphs list some of hazardous items used afloat.

ACID.— Unless classified as safe material in the *Naval Ships' Technical Manual*, chapter 670, store liquid acid in the acid locker. If the acid locker is not available, stow acid bottles in the flammable storeroom. However, a watertight rubber lining must cover the deck and the lower part of the bulkhead. Also, label the space with **ACID BOTTLE STOWAGE**, in 3/8-inch letters, securely attached to the outside of the storeroom door. Corrosive acids are acute fire hazards. Stow corrosive acids separately from oxidizing or flammable materials. Avoid contact of corrosive acids with your skin or eyes. Personnel handling these acids must wear rubber gloves, rubber aprons, and goggles for protection.

ALCOHOL.— Since most alcohols have a flash point below 100°F, all alcohol must be stored in flammable liquid storerooms. Store grain alcohol (ethanol or ethyl alcohol) in an alcohol locker.

OXIDIZING MATERIAL.— The HMIS lists oxidizing material by Special Material Content Code J (Juliet). Store all oxidizing material in a dry compartment away from combustible materials. One of the oxidizing materials used onboard ships is calcium hypochlorite. It is a bleaching agent and disinfectant. Ships use calcium hypochlorite for purification of potable water, sewage treatment, and biological and chemical agent decontamination. Calcium hypochlorite itself is noncombustible. However, it is a strong oxidizing agent that will generate heat and liberate chlorine. It can also cause fire when stowed in contact with paints, grease, oils, detergents, and other combustible materials.

Calcium hypochlorite should be stored in bins or lockers. The storage space must contain the label **HAZARDOUS MATERIAL-CALCIUM HYPOCHLORITE** in red letters on a white background.

COMPRESSED GASES.— Compressed gas is any material or mixture in the container that has an absolute pressure of more than 40 psi (pounds per square inch) at 70°F. Or, regardless of pressure at 70°F, it may contain an absolute pressure of more than 104 psi at 130°F. Compressed gas also includes any liquid flammable material that has a vapor pressure above 40 psi at 100°F.

On ships, compressed gases are stored on the weather deck unless the ship has specifically designed spaces below deck for such material. When stored, compressed gas cylinders must be vertical and secured

with the valve protection caps in place. Compressed gas cylinders must be located away from other flammable materials, especially grease and oil. Also, the cylinders must be as far away as possible from navigation, fire control, or gun stations. The cylinders must be protected from the direct rays of the sun or accumulations of snow and ice.

You must take precautions when storing compressed gases below decks. You must prevent any leaking fumes from entering ventilation air intakes leading to working or living spaces.

Usually, empty cylinders still have some gas remaining in them; therefore, you must stow and handle empty cylinders with the same precautions as full cylinders. You must handle compressed gases, particularly the flammable and explosive gases, with extreme care.

You must prevent cylinders from dropping or forcefully striking against hard surfaces. You must not allow the tampering of cylinder safety devices. When not in use, be sure that the valve protection cap is secure in place. If the valve of the cylinder should snap off, the cylinder can behave like a missile. For example, a cylinder with 2,200 pounds per square inch (psi) pressure can travel 2,600 feet in free flight. This is disastrous when it happens in a confined space. The following paragraphs describe the safety requirements you must observe when handling compressed gas cylinders.

You must prevent cylinders from coming in contact with tire, sparks, or electrical circuits. Exploding steel cylinders have the same destructive effect as a bomb.

Do not drag or slide cylinders when moving them. You must use hand trucks, as prescribed by *Naval Ships' Technical Manual*, chapter 9230. If hand trucks are not available, tilt the cylinder and roll it on the bottom edge.

During loading or offloading of gas cylinders, you must secure them to a cradle, pallet, or rack. Never hoist cylinders with electromagnets, or with hooks or lines attached to the valve protection caps.

You must prevent the altering or defacing of the numbers or markings on the cylinders. Do not add markings to the cylinders without approval from the engineering officer. Do not issue cylinders if you cannot identify their contents.

The *Naval Ships' Technical Manual*, chapter 550, contains detailed information about the stowage, handling, and use of various types of compressed gases.

Anyone handling gas cylinders must be familiar with the color coding used on them. The color codes and markings identify the contents of the cylinders. The color coding is used as a hazard warning. The color coding consists of primary and secondary color

warnings. The primary color warning is the color assigned to identify the classification of the material according to its primary hazard from a safety standpoint. These colors appear as the main body, top, or band colors on compressed gas cylinders. A secondary color warning is the color assigned as a warning of a secondary hazard held by a material. This means that the material may have another type of secondary hazard that is distinctly different from that shown by its primary color warning. These colors appear as band colors on compressed gas cylinders. The following sections list the colors used as both primary and secondary warnings.

Yellow identifies flammable or combustible materials.

Brown identifies toxic and poisonous materials.

Blue identifies anesthetics and harmful materials. These are materials that produce anesthetic vapors and liquid chemicals and compounds hazardous to life and property. However, these materials do not normally produce dangerous quantities of fumes or vapors.

Green identifies oxidizing materials. These are all materials that readily furnish oxygen for combustion and react explosively when they come in contact with hot material.

Gray identifies physically dangerous materials. These are materials, safe in themselves, that are asphyxiating in confined areas. These also are materials handled in a dangerous physical state of pressure or temperature.

Red identifies fire protection materials.

Black identifies a combination of oxygen and other gases.

Buff (tan) identifies industrial gases.

Orange identifies refrigerants.

In addition to its basic colors, each cylinder marking may include a combination of colored stripes to identify a particular compressed gas. Refer to chapter 2 of NAVSUP P-485 or to P-567 for a listing of the different types of gases and the color markings used on compressed gas cylinders.

Aerosol products are liquids, solutions, or powders contained in pressurized dispensers. The dispensers have release valves to control the discharge amount of the product. Aerosol containers are commonly used for the disposal of paints, enamels, lacquers, insecticides, silicones, and rust preventives. The aerosol propellant may be low-boiling, halogenated hydrocarbons or other

hydrocarbons such as liquid propane or isobutane. Aerosol cylinders will burst if exposed to heat sources more than 120°F. Aerosol cans are prone to leakage when dented or hit against hard objects. Aerosol propellants are extremely flammable and, in enough concentration, can be anesthetic or asphyxiating. Therefore, aerosol products should be stowed in the flammable liquids storeroom or in cabinets away from oxidizing materials. The space should have mechanical ventilation, when necessary, to remove accumulated vapors.

RADIOACTIVE MATERIAL.— Radioactive materials are assigned an SMCC of R or X if radioactive and magnetic. These materials have the United States Nuclear Regulatory Commission (USNRC) radiation symbol label. This label must be in good condition and remain with the material at all times. Any area used for storing radioactive material must have the standard radiation symbol and the words **CAUTION RADIOACTIVE MATERIAL** conspicuously posted. Report any suspected radiation hazard promptly to the radiological safety officer and a representative of the medical department.

Miscellaneous Material

This section lists those other items requiring special handling.

CLASSIFIED MATERIAL.— Stowage and handling of classified material must be in accordance with the Department of the Navy Supplement to the *DOD Information Security Program Regulation*, OPNAVINST 5510.1.

DELICATE INSTRUMENTS.— Delicate instruments are usually expensive and easily damaged. These materials require especially careful handling and protective stowage. You must keep the instruments in a dry atmosphere, away from magnetron tubes or magnetic devices. When possible, the storeroom temperature should be 70°F or below.

DRUMMED PRODUCTS.— Drummed products on board ships may contain flammable liquids or nonflammable material. Stow drums on end with the bung end on top. Each drum must have adequate identification of its contents legibly indicated on the side of the drum. If stowed on the weather deck cover the drums with a tarpaulin (when practical). Drummed products must be inspected at least weekly to make sure the bungs are tight and there are no leaks or corrosion.

SHELF-LIFE MATERIAL.— Shelf-life material requires inspection upon receipt to ensure adequate

packaging and preservation. You must locate this material in spaces that are least likely to cause its deterioration. You also must use the coolest and driest space available for storing the more deteriorative materials, such as dry cell batteries and rubber products. To make periodic screening easier, consolidate shelf-life items in a readily accessible area whenever possible.

AIRCRAFT ENGINES.— While stored, an engine must be in its original container unless authorized to be stowed on an engine stand/cart. Aircraft engines are expensive items and require extreme protection and accountability. In older ships, aircraft engines are stowed on weather decks or sponsons. Stowage and issue of aircraft engines to and from the weather deck area require the use of a crane or hoisting equipment. Newer ships have bulk stowage areas assigned in the hangar bay area. Movement of aircraft engines in the hangar bay area requires a forklift or an overhead hoist. Regardless of stowage space, you must always keep aircraft engines and containers secured for sea. Securing for sea means tying the engines and containers down to prevent shifting in any direction. To preserve the condition of an engine, conduct corrosion preventive maintenance according to the specific engine manual. The supporting maintenance department normally conducts the corrosion preventive maintenance.

MATERIAL HANDLING EQUIPMENT

To keep the Navy supplied with the volume of material it requires, many types of handling equipment was selected to haul, unload, store, and issue material. You must remember that whether the job at hand is handling or storing of material, a piece of equipment is usually available for the job. Also, remember that any piece of material-handling equipment is only as efficient as the person operating it.

Throughout your naval career as an AK, your job may be operating material-handling equipment or supervising an operation that uses the equipment. Therefore, you should be familiar with the types of material-handling equipment commonly used at naval activities. *Storage and Material-Handling*, DOD 4145.19-R-1, chapter 4, and *Naval Ships' Technical Manual*, chapter 572, give detailed information on this topic.

Material handling is the lifting and shifting of materials up, down, or sideways. In other words, it means the movement of material other than by a common carrier. We constantly move material for processing in receiving, storage, packing, and shipping

areas. In the process of moving material, a piece of equipment is usually available for the handling of that material.

When assigned, you can be the material-handling equipment operator or supervisor of the operation. Therefore, you must become familiar with the types of material-handling equipment used in the Navy. The Navy uses a variety of material-handling equipment. The following text contains descriptions of the equipment and information about its use.

NOTE: The information presented here is not a complete training guide for the use of material-handling equipment. Its purpose is to give you the basic knowledge about the equipment. You must get proper training and licensing before operating any material-handling equipment.

FORKLIFT TRUCK

The forklift truck is probably the most widely used power-driven piece of material-handling equipment assigned to the supply department. The purpose of forklift trucks is to pick up, carry, and stack unit loads of supplies and equipment.

Equipped with telescopic masts, forklift trucks are able to lift loads beyond the height of the collapsed mast. Most trucks have free lift capability. Free lift is the lifting height of the forks before the inner slides move upward from the mast and increase the overall height.

Gasoline-powered forklift trucks may have solid rubber or semisolid tires for use in warehouses. We use forklift trucks with pneumatic tires for handling material in outdoor storage areas. Electric-powered trucks have solid rubber or semisolid tires for indoor operations only.

Forklift trucks are commonly used for handling palletized unit loads. They are also used for hauling boxes or containers equipped with skids and large rigid containers or packages. Forklift trucks are used aboard ship, on barges, on piers, in warehouses, in freight terminals, and on the ground to lift heavy containers. In unpaved yards or storage areas not covered with hard surfaces, the trucks must have pneumatic tires to operate efficiently.

Occasionally, forklift trucks are used in place of tractors. Forklift trucks are more efficient if used for elevating palletized loads into storage and for handling palletized loads between hauling operations. You should not use forklift trucks for traveling with individual loads for distances of more than 400 feet. Use tractor trailer trains if the operation requires travel for greater distances. When using tractor-trailer trains or other

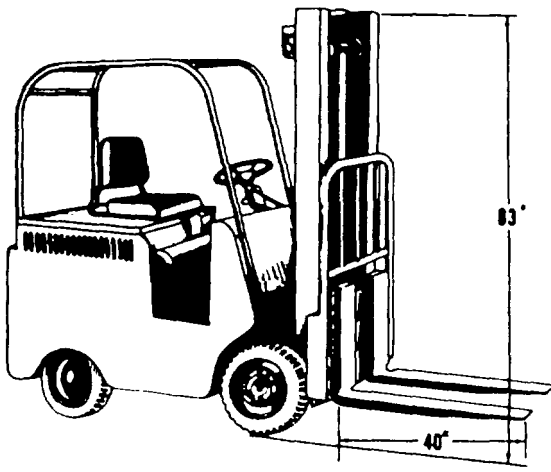


Figure 6-2.-Forklift truck.

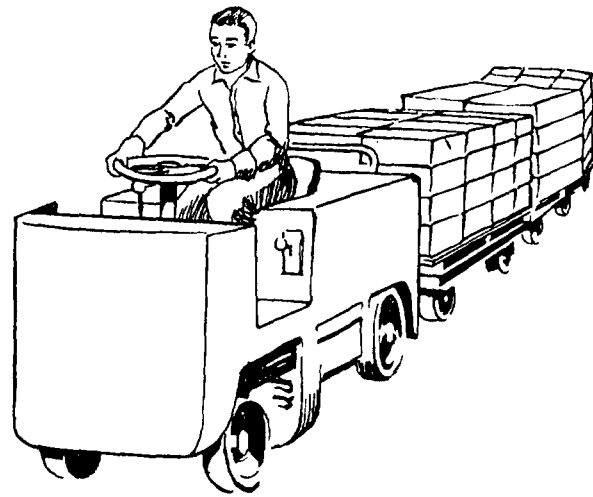


Figure 6-3.-Tractor-trailer train.

material-handling equipment, use a forklift truck at each end of the haul for loading, unloading, and stacking. This will make the operation faster and easier. Figure 6-2 shows a 6,000-pound forklift truck.

TRACTOR-TRAILER TRAINS

The tractor-trailer train (fig. 6-3) is a system that consists of a self-propelled power unit connected to a series of trailers. There are various types of tractors used for pulling the trailers. Tractor-trailer trains can haul heavier tonnage than carrier-type trucks of equal horsepower capacity. They can pull trains up to the total drawbar pull of the tractor. The number of trailers one tractor can continuously pull depends upon the length of haul, nature of material, and weight of the load of each trailer. Under normal conditions, one tractor should be able to operate with three sets of trailers. One set of trailers for loading, pulling a second set underway, and a third set unloading. Tractor-trailer trains are effective for hauling loads between 400 feet to 1 mile.

WAREHOUSE TRACTORS

A warehouse tractor is an electric- or gasoline-powered vehicle designed to pull a train of warehouse trailers. The gasoline-powered models used in the Navy have pneumatic tires and a rated drawbar pull of 4,000 to 7,500 pounds. Electric-powered models commonly used in the Navy have solid rubber tires and a rated drawbar pull of 2,000 or 4,000 pounds. The drawbar pull, the motive force that a tractor can exert in pushing or pulling loads, is merely a means of saying tractor capability. The actual capacity of the tractor is normally far more than the drawbar-pull rating. For example, a

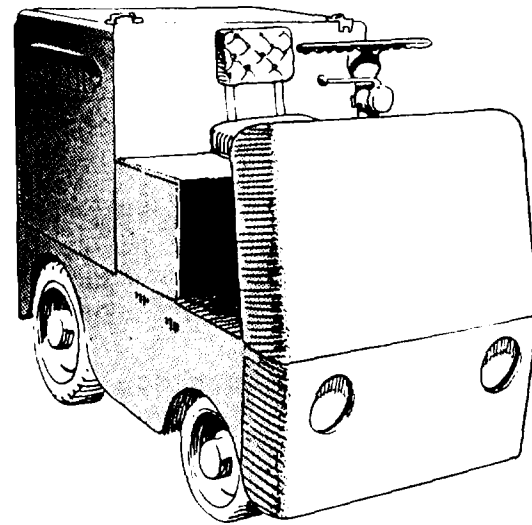


Figure 6-4.-Warehouse tractor.

tractor with a drawbar pull of 4,000 pounds may have an actual towing capacity of 90 tons.

Five different models of tractors was adopted as standard for the military services. The 2,000-pound, drawbar-pull, electric-powered warehouse tractor has solid rubber tires. It is a light-duty tractor for operation in warehouses and other closed storage areas.

The 4,000-pound, drawbar-pull, electric-powered warehouse tractor (fig. 6-4) has solid rubber tires. It is the standard heavy-duty tractor for indoor warehousing operations. This type of tractor is used in a similar manner and for the same purposes as the light-duty, 2,000-pound model.

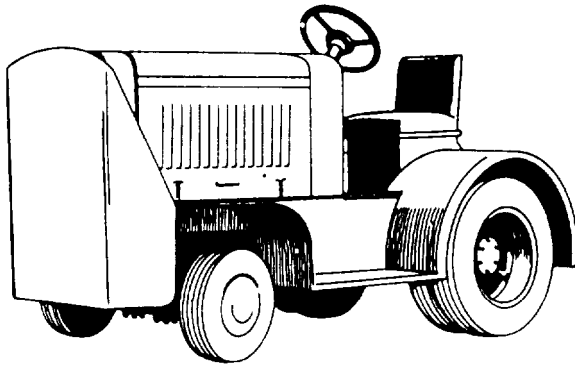


Figure 6-5.-Gasoline-powered tractor.

The 4,000-pound, drawbar-pull, gasoline-powered warehouse tractor (fig. 6-5) has pneumatic tires. It is a standard medium-duty tractor for outdoor storage operations. This tractor is used in outside storage areas for hauling trailers or for towing aircraft. It also may be used for general-purpose towing or pulling at freight sheds, piers, warehouses, or other areas. It has enough weight, horsepower, and traction to operate on virtually all types of running surfaces.

The 7,500-pound, drawbar-pull, gasoline-powered warehouse tractor has pneumatic tires. It is the standard heavy-duty tractor for outdoor storage operations. This capacity tractor is available in two sizes. The first type is the low profile, industrial type tractor with conventional pneumatic tires on both drive and steering wheels. The second type is the high flotation model with oversized pneumatic tires on the drive wheels.

WAREHOUSE TRAILERS

A warehouse trailer is a load-carrying platform mounted on caster wheels. Standard trailers are available in a wide variety of sizes and capacities and may have solid rubber or pneumatic tires. The caster-steering type has fixed rear wheels that carry about two-thirds of the load and caster wheels at the front for steering. There are two models of caster steering type trailers. They are the 4,000- and 6,000-pound capacity models, similar to the one illustrated in figure 6-6. The caster steering type trailer suits indoor operations better.

The fifth-wheel steering type warehouse trailer has rear wheels mounted on a rigid axle and front wheels mounted on a center-pivoted steering axle with a drawbar attachment. This type of trailer is available with a capacity of either 6,000 or 20,000 pounds. It is more

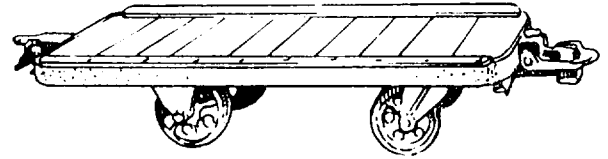


Figure 6-6.-Warehouse trailer.

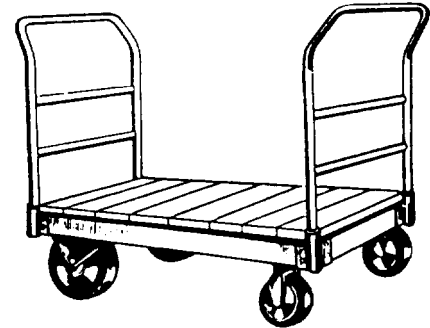


Figure 6-7.-Four-wheel platform hand truck.

suitable for heavy loads or for operations over rough surfaces.

HAND TRUCKS

Hand trucks are particularly useful in places where other mechanical equipment cannot operate because of space limitations. Hand trucks may be constructed of wood or metal. They are often preferable to and more economical than a piece of mechanical equipment for the movement of a single item.

The four-wheel platform hand truck (fig. 6-7) is advantageous for breaking out retail issues for bins or carrying light loads. Platform hand trucks are commonly used for any operation involving short hauls with frequent stops.

The two-wheel hand truck (fig. 6-8) has two handles, a platform where the load rests, and a pair of wheels attached to the bottom of the framework. It has a blade that extends at an angle from the bottom of the platform to hold the load. It also has two metal legs located near the top of the platform to help bear the load when the truck is resting flat on the ground. The platform of the truck may have flat crossbars for handling boxes or crates, or curved crossbars for handling barrels or drums.

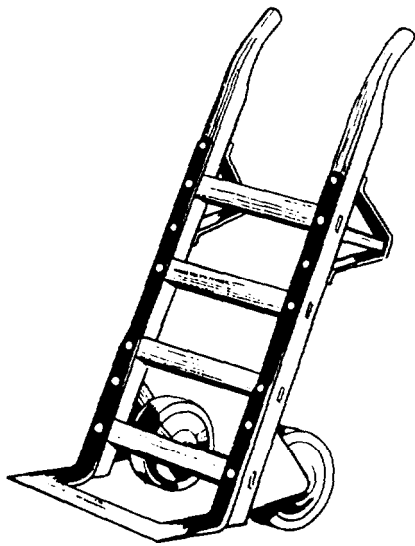


Figure 6-8.-Two-wheel hand truck.

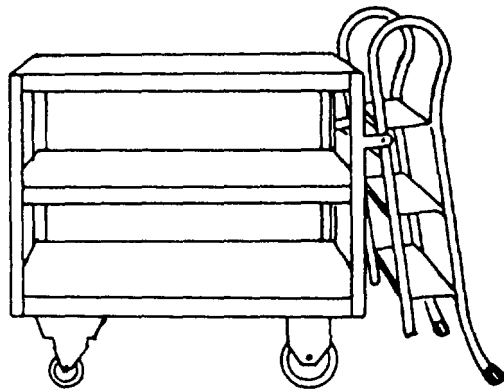


Figure 6-9.-Stockpicker truck.

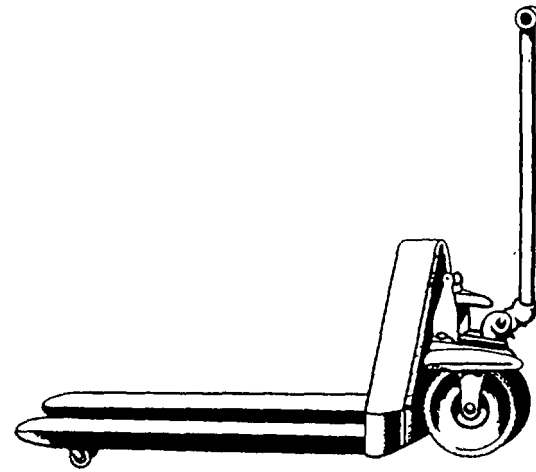


Figure 6-10.-Hand pallet truck manual/hydraulic.

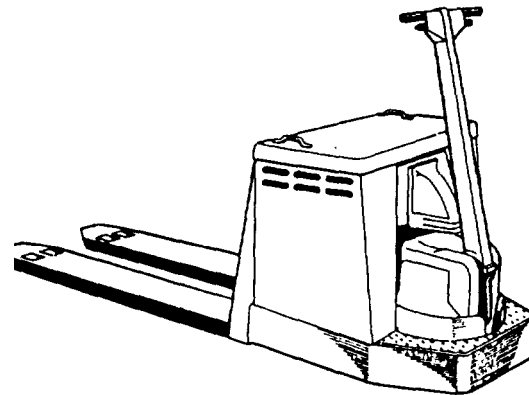


Figure 6-11.-Electric hand pallet truck.

A stockpicker truck (fig. 6-9) is a hand truck used for picking stock from retail shelves to fill orders. The truck is small enough for warehouse personnel to push into the aisles between the shelves. Personnel use the truck shelves to carry small items in cardboard containers, paper envelopes, or tote boxes. Some models of stockpicker trucks have a ladder to allow personnel to reach materials on high shelves safely.

HAND PALLET TRUCK

The hand pallet truck is available in two distinct designs. They are the hand-operated, hand-propelled model and the electric-powered, hand-operated model. The pallet truck has two load-carrying forks that can rise about 4 inches to carry palletized loads. Its purpose is to move pallet loads, which do not require stacking, in

short hauls. This includes moving pallet loads into cargo trucks as well as moving material during shipping and receiving operations. It works well with forklift trucks and can access areas where a forklift cannot because of space limitations.

The manual/hydraulic model (fig. 6-10) works well in loading and unloading cargo trucks and aircraft. This model is used whenever the operating conditions do not require a hand truck with the special characteristics of the powered model.

The electric hand pallet truck (fig. 6-11) is advantageous for moving pallet loads to longer distances. We also use this truck when the size of the load, the presence of grades or inclines along the route, or other considerations require the use of powered equipment.

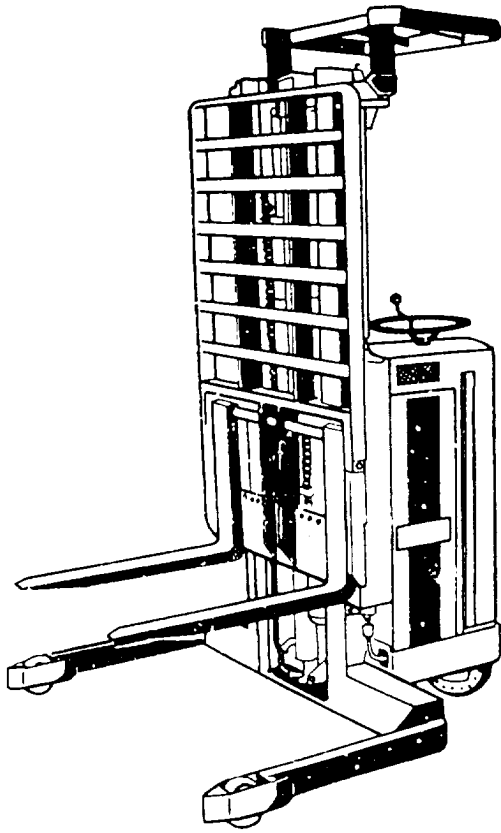


Figure 6-12.-Tiering truck.

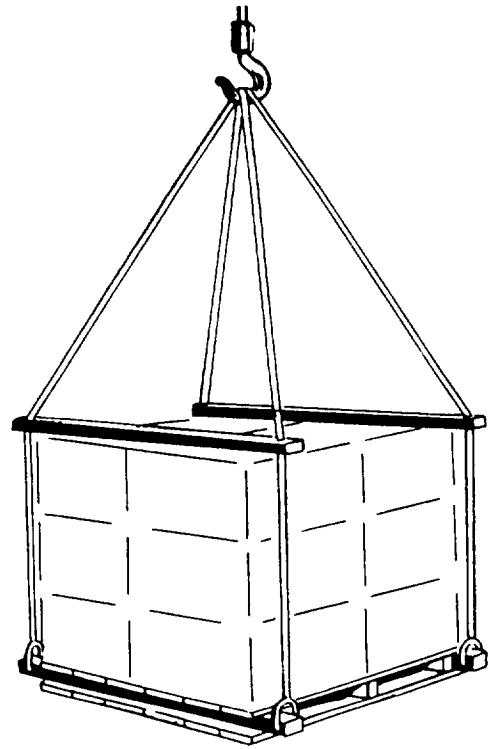


Figure 6-13.-Pallet sling.

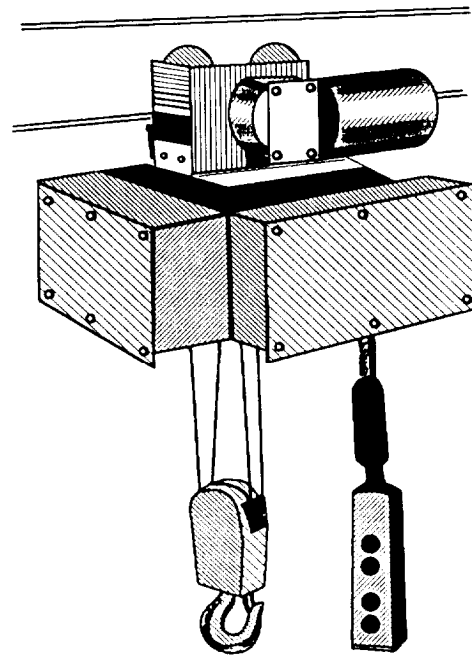
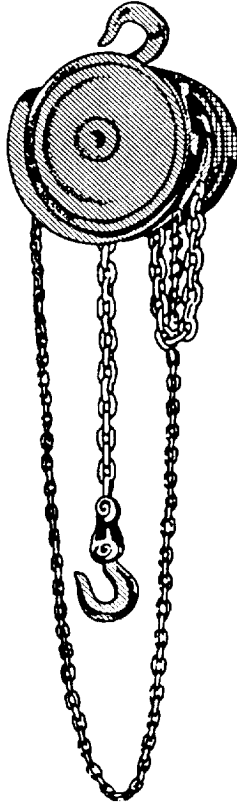


Figure 6-14.- (View A) Manual chain hoist; (View B) electric hoist.

TIERING TRUCK

The tiering truck (fig. 6-12) is an electric-powered forklift truck of the straddle-arm design. The location of the forks on the tiering truck are between two outriggers or straddle arms. The straddle arms extend forward in a plane at floor level parallel to that of the forks to straddle the pallet load. Because the straddle arms have contact with the floor, they support the elevated load and do not require a counterweight. The overall weight of the tiering truck is less than that of a conventional forklift truck of the same rated capacity. The tiering truck is more maneuverable than the standard forklift truck and it can operate in 6-foot aisles. The standard tiering truck for the military services is the electric-powered type. It has a load capacity of 3,000 pounds and a lifting height of 100 to 130 inches.

PALLET SLING

The pallet sling (fig. 6-13) is used for overhead lifting of palletized loads by a crane or ship's boom. Normally, a cable is used for the sling, but a line or chain may be used, depending on the weight of material to be lifted.

Slings have rigid horizontal supports at the base, usually made of steel bars or pipes. The horizontal support must be strong enough to distribute the load across the entire length.

Some slings have movable spreader bars at the top to prevent crushing the load while it is being lifted.

HOISTS, PULLEYS, AND DOLLIES

Various types of hoists, pulleys, and dollies are available ashore and afloat for moving equipment and supplies. You should familiarize yourself with this equipment and its purpose so that as various situations arise, you can select the proper piece of equipment.

Hoists

Chain hoists or chain falls provide a convenient and efficient method for hoisting loads by hand. The advantages of chain hoists are that one person can raise a load of several tons. Also, without securing the load, it can remain stationary. One person can carry and operate the manually operated chain hoists (fig. 6-14, view A). They are particularly useful in loading and unloading cargo trucks. They also are convenient for working in small storerooms aboard ship when other mechanized equipment is not available.

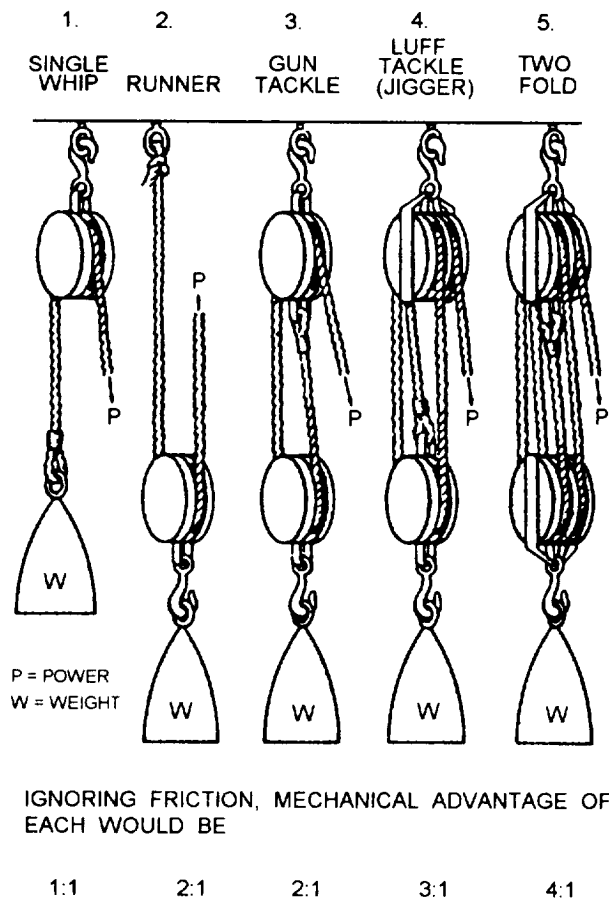


Figure 6-15. Blocks and tackles.

Some larger storerooms have electrically operated hoists that move along overhead tracks (fig. 6-14, view B). Electric hoists lift their loads by either chain or cable. Other models are pneumatic or air hoists that operate by compressed air. These hoists have the advantages of speed and ease of operation.

Block and Tackle

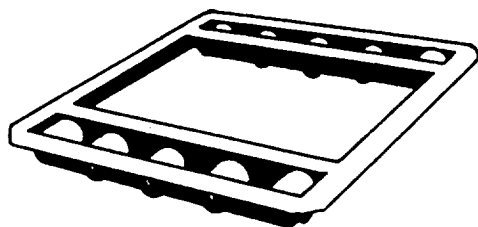
A block and tackle is the arrangement of one or more pulleys with rope or cable for pulling or hoisting large or heavy objects. The block and tackle (also called tackle or pulley) is used in the same situations as the chain hoist, except for smaller loads. Figure 6-15 shows the different types of blocks and tackles. It also provides the formula for figuring the amount of power needed to move the weight of the load.

Dollies

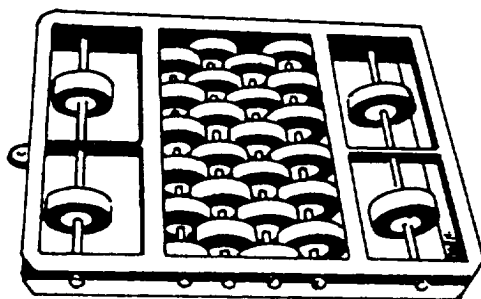
The dolly or dolly truck is a frame mounted on wheels or rollers. Dolly trucks are used for moving or



A
GENERAL PURPOSE DOLLY



B
PALLET-ROLLERS DOLLY



C
REEFER-CAR DOLLY

Figure 6-16.-(View A) General-purpose dolly (View B) pallet-rollers dolly; (View C) reefer-car dolly.

shifting heavy loads for short distances. Figure 6-16 shows the three common types of dollies used by the Navy.

The general-purpose dolly (fig. 6-16, view A) is used to move unpalletized large, bulky, or heavy material over short distances.

The pallet-rollers dolly (fig. 6-16, view B) has a capacity of 4,000 pounds. The purpose of the pallet-rollers dolly is to move palletized loads in and out of boxcars, trucks, trailers, and storerooms.

The reefer-car dolly (fig. 6-16, view C) is easy to maneuver, and is suitable for use on truck and reefer floors. The 24 wheels in the central position are slightly lower than the wheels at the ends. The springs hold the end wheels in position to allow the wheels to move on their axles while guiding the load to its destination.

SAFETY

This section provides information about general industrial and operational safety for storage and handling of material. This information is based in part from DOD4145. 19-R-1. The Navy *Occupational Safety and Health (NAVOSH) Program Manual*, OPNAVINST 5100.23, addresses the maintenance of safe and healthful conditions in the workplace. Check with your activity's safety program manager for specific safety requirements in your command.

ACCIDENTS

Manpower is the number one resource in the Navy. Accidents involving personnel directly affect productive man-hours and planned schedules. It takes time to recover man-hours lost because of accidents. Replacement personnel, or required skills, are not readily available.

When an accident causes destruction of material, it cost dollars to make necessary repairs or replacement. This can also result in a delay in production and possible shortage of critical material.

SAFETY TRAINING

Personnel must be given the proper safety training associated with their daily work. Safety training will reduce the potential for accidents.

Knowledge of Hazardous Material

Certain items, such as explosives, flammable material, and chemicals, require more care and attention than other items. Personnel handling hazardous material must have a knowledge of all potential hazards of the commodities under their control. Refer to the *DOD Hazardous Materials Information System Procedures (HMIS)*, DOD 6050.5-M, for additional information. The DOD 6050.5-M also describes the DOD 6050.5-L and DOD 6050.5-LR in microfiche format. The DOD 6050.5-LR is the complete annual and quarterly output by the system. It is intended for use by safety, health, transportation, and disposal specialists to ensure regulations of OSHA are followed. The DOD 6050, 5-L consist of the same data elements as DOD 6050.5-LR, minus the restricted data elements. The HMIS is also available in compact disk (CD) format. Both versions are issued quarterly. The latest version will continuously supersede the previous version.

Knowledge of Equipment

Each piece of equipment used in the Navy is designed to perform a specific function. For example, material handling equipment can safely handle a specified maximum load and operate under specified conditions. You create a potential hazard when you use equipment beyond its rated capacity or for other than its intended purpose. You must use a piece of equipment only for the purpose for which it is designed. As an example, when handling flammable gases, you must use the electric-powered and spark-enclosed equipment.

Equipment must be in proper operating condition. The operators must ensure that the equipment is mechanically safe. Operators must report all unsafe equipment conditions to the supervisor for correction or replacement. Equipment operators should also familiarize themselves with the layout of the area they are working in. Some of the factors to consider in the layout are distance of travel, type of terrain, elevation changes, and aisles. The greater the distance traveled or the rougher the terrain, the greater the potential for accidents. Changes in elevation involve extra handling and increases the potential for accidents. Narrow aisles, turns and jogs in aisles, and protruding objects also are safety hazards.

SAFETY EQUIPMENT AND CLOTHING

The use of safety equipment and clothing provide extra protection to personnel. The following text describes some of the items that you can use to protect yourself while working.

Synthetic Rubber Gloves

You must wear synthetic rubber gloves for protection when handling ordinary commercial concentrations of harmful chemicals, petroleum products, or chlorinated solvents.

Natural Rubber Gloves

You must wear natural rubber gloves when handling high concentrations of acids and alkalis, organic solvents, or highly toxic or corrosive chemicals. DO NOT use this type of glove for protection against petroleum products and chlorinated solvents.

General-Purpose Work Gloves

You must wear general-purpose work gloves for protection against cuts or abrasions when handling sharp or rough material. These gloves are made from leather material that cover the palm, thumb, and index finger areas. When using gloves with leather parts, make sure the leather parts do not become greasy.

Hoods, Aprons, Sleeves, and Suits

You must wear hoods, aprons, sleeves, or suits made from natural or synthetic rubber or acid-resisting rubberized cloth when handling acid.

Rubber-framed Goggles

You must use rubber framed goggles to protect your eyes against smoke, gas, fine dust, mists, and sprays of liquid or substances.

Spectacle Goggles

You must wear spectacle goggles with side shields for protection against flying particles of dust, chips, and machine cuttings.

Protective Helmet

You must wear a helmet for protection against falling or flying objects. While working in cramped places, you must wear a helmet to protect you from bumps against hard objects. A helmet is mandatory when you are working in a shipyard or in areas where you are hoisting and lifting materials.

Safety Shoes

You must wear authorized safety shoes while working in foot-hazardous areas.

SAFE STORAGE RULES

Good housekeeping practices are essential to safety as well as to efficient storage operations. Storage areas maintained in a clean and orderly condition can prevent many potential accidents and fires. Adequate lighting in storage areas decreases the hazards of accidents and enhances personnel health and morale. Place and secure storage materials in a safe manner that will prevent them from shifting or falling. Stack pallet loads with 2 inches of clearance on both sides to prevent dislocation of adjacent units.

Height of Stacks

This section describes the required limitations for storing materials. The height of stacks should not be limited except when required for operations stability and to maintain clearances and floor load limits. Below automatic sprinkler deflectors, there must be an 18-inch clearance when the stack height of material is not more than 15 feet. Maintain a 36-inch clearance for a stack height that is more than 15 feet. For hazardous material, maintain a 36-inch clearance regardless of the stack height. Maintain an 18-inch clearance when the height of the stack below joists, rafters, beams, or roof trusses is not more than 15 feet. Maintain a 36-inch clearance when the stack height is more than 15 feet. Regardless of the height, stacks in buildings without automatic sprinklers must have a 36-inch clearance.

Clearances

The requirement for maintaining clearance between stored material and the walls apply to specific situations. In buildings with substandard fire walls (less than 4-hour rating), you must maintain a clearance of 24 inches. You must maintain a 24-inch clearance for hazardous materials stored in general-purpose buildings. For materials subject to excessive swelling, you must maintain a clearance not to exceed 12 inches. The clearance maintained around fire doors is 24 inches between stock and the fire door, except the door near the aisle. The portion of the fire door near the aisle must have a 36-inch clearance. Where there is a protective barricade provided for the fire door, no clearance between the stock and barricade is required.